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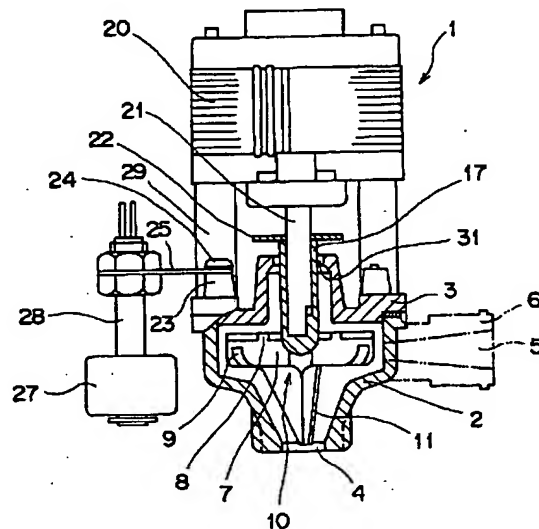
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(54) 【発明の名称】 排水ポンプ

(57) 【要約】

【課題】 排水ポンプをより小形軽量化すると共に、その排水能力を高めることおよび取付けスペースを少なく、しかも耐久性や経済性を向上させること。

【解決手段】 この排水ポンプは、下端部に流入口(4)をかつほぼ漏斗状で上方の大径側の側部に吐出口(5)を有する本体(2)を備え、本体内部に、モータの駆動軸に同軸に嵌合連結したランナボス(17)と、ほぼ円盤状のランナデスク(7)およびその下部に複数の旋回羽根(11)とが一体に形成されたランナ(10)を、旋回羽根を流入口に臨ませかつランナデスクを漏斗状の上方大径側に収めて共に回転自在であるように設ける。ランナデスクは、その下面に、旋回羽根の軸心基部から放射状に外周に向けて連通する複数のランナ流通路(9)を有しかつ上面に、複数の補助羽根(8)を放射状に突出させてある。旋回羽根の軸心基部近傍とランナボス近傍間とを連通させる通気路を設けてある。



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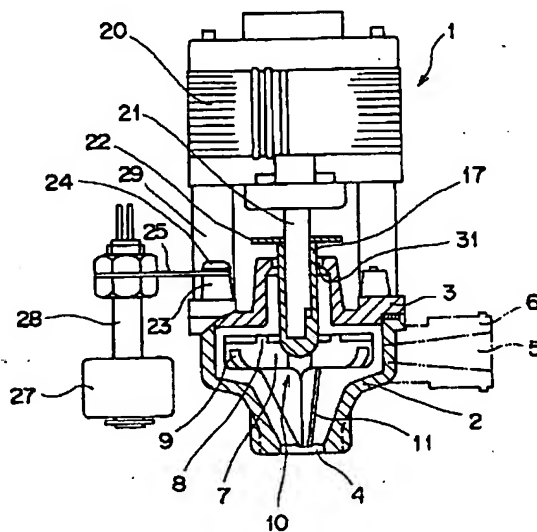
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【特許請求の範囲】

【請求項1】 下端部に流入口を有しかつほぼ漏斗状で上方の大径側の側部に吐出口を有する本体を備え、この本体内部に、モータの駆動軸と同軸に嵌合連結したランナボスと、ほぼ円盤状のランナデスクおよびその下部に複数個の旋回羽根とが一体に形成されたランナを、前記旋回羽根を前記流入口に臨ませかつ前記ランナデスクを前記漏斗状の上方大径側に収めて共に回転自在であるように設け、

前記ランナデスクは、その下面に、前記旋回羽根の軸心基部から放射状にその外周に向けて連通する複数個のランナ流通路を備え、その上面には、複数個の補助羽根を放射状に突設させ、

前記旋回羽根の軸心基部近傍と前記ランナボス近傍間とを連通させる通路を貫設したことを特徴とする排水ポンプ。

【請求項2】 下端部に流入口を有しかつほぼ漏斗状で上方の大径側の側部に吐出口を有する本体を備え、この本体内部に、モータの駆動軸と同軸に嵌合連結したランナボスと、ほぼ円盤状のランナデスクおよびその下部に複数個の旋回羽根とが一体に形成されたランナを、前記旋回羽根を前記流入口に臨ませかつ前記ランナデスクを前記漏斗状の上方大径側に収めて共に回転自在であるように設け、

前記ランナデスクは、その下面に、前記旋回羽根に連結して放射状に外周に向けて突設した複数個の下放射羽根を備え、その上面には複数個の補助羽根を放射状に突設させ、

これらの下放射羽根と補助羽根とを、その上面および下面にそれぞれ突設させた天板状のランナデスクのランナボスと前記旋回羽根とのそれぞれ基部の間を連通する通路を貫設したことを特徴とする排水ポンプ。

【請求項3】 前記旋回羽根は、複数個のほぼ逆三角形であることを特徴とする請求項1または2の排水ポンプ。

【請求項4】 前記旋回羽根は、軸心に対して捩じれ角を有しかつリードをもつねじポンプを形成することを特徴とする請求項1または2の排水ポンプ。

【請求項5】 前記ランナ流通路はほぼ逆四角溝であることを特徴とする請求項1、3および4のうちのいずれか一つによる排水ポンプ。

【請求項6】 前記ランナ流通路は、ランナの回転方向の後側側に傾斜を有するほぼ逆梯形溝状であることを特徴とする請求項1、3および4のうちのいずれか一つによる排水ポンプ。

【請求項7】 前記駆動軸およびランナボスの軸挿入口を有し、前記本体を覆い、これと結合しかつ前記モータを取り付ける蓋の上側に、水位を検知する液面センサなどの取付部を備えたことを特徴とする請求項1から6までのうちのいずれか一つによる排水ポンプ。

【請求項8】 前記本体の、蓋と結合するフランジ部は、これを底面から見た円形の左右もしくはおおよび上下またはいずれかの少なくとも一箇所の円弧の一部を削除して弦側部が形成されていることを特徴とする請求項1から7までのうちのいずれか一つに記載の排水ポンプ。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、例えば空調機器の室内ユニットの熱交換器表面で結露によって発生するドレン水（以下単にドレンと言う）をドレンパンから揚水して外部に排出する自吸式の非容積型回転ポンプに関する。

【0002】

【従来の技術】空調機器などから発生するドレンを揚水排出する排水ポンプとしては、（イ）実開昭63-105796号、（ロ）実公平3-35915号、（ハ）特開平7-63188号、（ニ）特開平8-210289号、（ホ）特開平8-285307号の各公報等に記載の枚挙に暇のないほど多数の従来技術がある。

【0003】これらの従来技術においても、何れも廉価でしかも耐久力のある限取誘導電動機を駆動源としたものが用いられている。前記（ロ）実公平3-35915号公報のものは、その羽根の駆動軸の近傍に大気を流入させる気体流入部を設けているが、この気体流入部は図示されているような小孔である。前記羽根の回転によって、ドレン水中の塵埃、バクテリア、水垢等の夾雑物が飛散し、前記小孔に付着し、目詰まりを生じて、通気を遮断してしまうのでおおよび駆動軸と蓋との間の隙間が前記ドレン中に含まれる夾雑物の固着によってモータの駆動回転を妨げるので、実際は前記従来例の何れもが、駆動軸もしくは旋回羽根の取付けボスとこれらが挿入される蓋の上部の穴との間に充分な間隙をもたせかつ空気流通部を兼ねさせている。

【0004】

【発明が解決しようとする課題】しかしながら、この充分な間隙をもたせたことが、ポンプの揚水中には旋回羽根のドレン水と気泡混入流体への打撃音の発生となり、さらにポンプ揚水停止直後の逆流水の溢流口となるおそれがある。また、この溢流は、従来の排水ポンプでは、揚程を高めると必然的に発生し、そのために遮音、防塵、防滴のカバーの取付け等の防止措置を講じなければならなかったが、それでも不十分であった。

【0005】また、前記した特に（イ）実開昭63-105796号、（ロ）実公平3-35915号の公報に開示の従来技術のものは、大凡50～250形（2～10馬力相当）の業務用の比較的大型の空調機器のドレン排水の用途に供されるものであったが、現在は2馬力相当もしくは50型以下の小業務用および家庭用の天井埋め込み形の空調機器室内ユニットにも利用されるようになり、したがって排水ポンプも、より小型軽量化と低騒音化が強く要望される現状

である。

【0006】本発明は、以上説明し、さらに後述する前記従来技術の問題点を解決するためになされたもので、特に排水ポンプの振動および騒音防止はもとより、いっそう小形軽量化すると共に、その揚排水能力を高めることおよび取付けスペースを少なく、しかも耐久性、経済性を向上させることをその課題とする。

【0007】

【課題を解決するための手段】上記の課題を解決するために、本発明による排水ポンプは、下端部に流入口を有しかつほぼ漏斗状で上方の大径側の側部に吐出口を有する本体を備え、この本体内部に、モータの駆動軸と同軸に嵌合連結したランナボスと、ほぼ円盤状のランナデスクおよびその下部に複数個の旋回羽根とが一体に形成されたランナを、前記旋回羽根を前記流入口に臨ませかつ前記ランナデスクを前記漏斗状の上方大径側に収めて共に回転自在であるように設け、前記ランナデスクは、その下面に、前記旋回羽根の軸心基部から放射状にその外周に向けて連通する複数個のランナ流通路を備えると共に、その上面には、複数個の補助羽根を放射状に突設させ、前記旋回羽根の軸心基部近傍と前記ランナボス近傍との間を連通させる通気路を貫設したことを特徴とする。

【0008】また、本発明により、下端部に流入口を有しかつほぼ漏斗状で上方の大径側の側部に吐出口を有する本体を備え、この本体内部に、モータの駆動軸と同軸に嵌合連結したランナボスと、ほぼ円盤状のランナデスクおよびその下部に複数個の旋回羽根とが一体に形成されたランナを、前記旋回羽根を前記流入口に臨ませかつ前記ランナデスクを前記漏斗状の上方大径側に収めて共に回転自在であるように設け、前記ランナデスクは、その下面に、前記旋回羽根に連結して放射状に外周に向けて突設した複数個の下放射羽根を備えると共に、その上面には複数個の補助羽根を放射状に突設させ、これらの下放射羽根と補助羽根とを、その上および下面にそれぞれ突設させた天板状のランナデスクのランナボスと前記旋回羽根とのそれぞれ基部の間を連通する通気路を貫設したことを特徴とする排水ポンプによっても同じ目的を達成できる。

【0009】さらに、前記旋回羽根は、複数個のほぼ逆三角形であり、もしくは前記旋回羽根は、軸心に対して振れ角を有しかつリードをもつねじポンプを形成することもできる。また、前記ランナ流通路はほぼ逆凹字溝であり、もしくはランナの回転方向の後ろ側に傾斜を有するほぼ逆梯形溝である。またさらに、前記駆動軸およびランナボスの軸挿入口を有し、前記本体を覆い、これと結合しかつ前記モータを取り付ける蓋の上側に、水位を検知する液面センサなどの取付け部を備えているのが好都合である。

【0010】そしてまた、蓋と結合する前記本体のフラ

ンジ部は、これを底面から見た円形の左右もしくはおおよび上下またはいずれかの少なくとも一箇所の円弧の一部を削除した弦側部が形成されているのが省スペースの上で好都合である。

【0011】

【発明の実施の形態】以下、本発明の実施の形態について添付した図面により説明するが、その前にまず図7および図8により従来技術の排水ポンプについてその概要を述べる。これは、前述した50形(2馬力相当)以下の家庭用および小業務用の空調機器のドレンの排水に用いるために小形化した排水ポンプの一部断面を表す縦断面説明図と底面図とを図7と図8にそれぞれ示したもので、下端に図示しないドレンパン内に臨み位置する流入口4'を設け、上方側部に吐出口5'を設けたほぼ中空逆円錐形の本体2'内に、この本体2'の内面に間隙をもって回転する複数のほぼ逆三角形の羽根を備えた旋回羽根11'と一体のランナボス17'が、前記本体2'を覆い取付けねじ26'によって螺締される蓋3'の軸挿入口31'と適宜間隙をもって、前記蓋3'の上部において取付けステム29'に取り付けられたモータ20'の駆動軸21'に嵌合連結されている。

【0012】前記ランナボス17'の上部で駆動軸21'には、水切板22が嵌設されている。また、本体2'のフランジ部12'の下部に取付けねじ24'により螺締された取付けステー25'には、ドレン水の液面を検知する液面センサ28'などを備えることもできる。

【0013】図示した液面センサ28'はフロート27を有し、液面の変化により、すなわちドレン水がドレンパンの一定水位になると、これを検知してスイッチが入り、排水ポンプ1'のモータ20'を起動させたり、あるいは常時の運転中、万一排水ポンプ1'が故障してドレンパンの水位が上昇し、溢水の警戒水位に達すると、信号を発しおおよしくは空調機器の電源をリレーによって切電する等の利用方法があり、フロート27に代えて光センサ等も用いられる。

【0014】このようにして、ドレンパンのドレン水が旋回羽根11'の下端を越えると、流入口4'から流入して旋回羽根の回転による遠心力によって上方の大径側に旋回しつつ上昇したドレン水は、吐出口5'から図示しない吐出接手6'に接続した導管を経て上昇外部に排出される。因に、図7において二点鎖線で描き示したものは、前述した50~250形(2~10馬力相当)の空調機器のドレン排水に用いられる比較的大量吐出し、その揚程も大きい前記従来技術(イ)実開昭63-105796号、(ロ)実公平3-35915号公報開示のものなどの実用例のほぼ現寸比較を示す排水ポンプの本体と蓋のフランジの一部の輪郭図である。

【0015】この従来の比較的大形のものと、これを小形化したものとのポンプの能力の比較は後述するが、そ

の大きさの比較例としてフランジもしくはランナの回転羽根の径の寸法の比は凡そ10:8である。そしてそれぞれの駆動モータは15 W、10 W、それぞれの回転数は負荷時にモータの滑りがあるためなどの要因により実測AC 200 V、50 Hzの場合に2800 RPM、60 Hzの場合には3360 RPM程度であった。

【0016】そして表1に示すように、これらの従来技術による排水ポンプは揚水中の騒音が前記50形を超える用途に供する前記(イ)、(ロ)等の比較的大形のものでは相当に大きく、小形軽量化した図7および図8に示す50形以下の空調機器に用いられる排水ポンプも、なお騒音が比較的大であって、この騒音と振動はこれら排水ポンプを備える空調機器の室内ユニット内で耳ざわりな音響を発生し、この騒音防止対策が課題であった。

【0017】また、小形軽量化を計った図7および図8に示した従来技術のものは、排水能力がもちろん低下する。現在、前記50形以下の空調機器も含めていっそうの小形軽量化が計られ、したがってこれらの機器に取り付けるドレン排水ポンプもさらに一段の小形軽量化と省取付けスペース、しかも低価格で吐出性能を向上させ、品質の安定したさらになお低騒音のものが要望されている。

【0018】このような市場のニーズに応じて、この課題を解決するためになされた本発明の排水ポンプをその一つの実施の形態を示す図1および図2によって説明する。図1は本発明の排水ポンプ1の一部断面を示した縦断面説明図、図2は図1の底面図である。本発明の構成は特許請求の範囲の欄で述べた通りで、従来公知の先行技術との相違、例えば図7と図8で述べたものとの特に相違する点は、ランナ10と、本体2のフランジ部12と、および蓋3の上部に、液面センサ28を取り付けるための取付けステー25とこれを取付けねじ24によって螺締着する取付けボス23を設けたことである。

【0019】その他の構成は、図7、図8のダッシュを除いた数字の符号と同一である。まず、ランナ10は、モータ20の駆動軸21に同軸に嵌合連結したランナボス17と、ほぼ円盤状のランナディスク7およびその下部に複数個の旋回羽根11とが一体に形成されており、前記旋回羽根11を本体2の下部の流入口4に臨ませ、前記ランナディスク7は前記本体2の漏斗状の上方大径側に共に回転自在に収められている。

【0020】そしてこのランナディスク7は、その下面に、前記旋回羽根11の軸心基部から放射状にその外周に向かって連通する複数個のランナ流通路9を備えると共に、その上面には複数個の補助羽根8を放射状に突設してあり、またランナディスク7には、前記旋回羽根11の軸心基部近傍と、前記ランナボス17近傍間とを連通させる通気路13(図3〜図6参照)を穿設してある。

【0021】この排水ポンプ1を空調機器へ取り付ける場合の省スペースを考慮して、本体2ともしくはこれを

覆う蓋3と共に、これらの本体フランジ部12が、その底面から見た円形の四隅或いはその他複数のこの両者を螺締着する取付けねじ26の座部位を残して、左右もしくはおおよび上下またはいずれかの少なくとも一箇所の円弧の一部を削除した弦側部が形成されている。取付けねじ26で螺締着以外の、互いに螺合もしくはフック等により蓋3を本体2に結合する場合も同様である。

【0022】なお、図2に示す本体2のフランジ部12の円弧の一部を削除して弦側部32を形成する場合に、円弧の一部を削除することに代えて、フランジ部12の取付けねじ26用取付け座の部分をおおよび耳状に残して直線的に切除して形成した側面を有するものであっても差し支えないものである。これによって、省取付けスペースはもちろん、素材費の節減になること、おおよび本体2の外側に液面センサ28などを付設する場合のいわゆる出っ張りを少なくする利点を生ずる。

【0023】そして、この排水ポンプ1をさらに小形軽量化することと、後述する騒音低減化の目的からその本体2の高さを縮小している。そのために、従来技術での本体2'のフランジ部12'の下面に、これと一体もしくは取付けステー25'を介して液面センサ28'やフロート27などを設けるようなことは、取付けスペースに余裕がなく不可能となった。それ故、本発明では、前記蓋3の上面側に取付けボス23を一体に備えて取付けステー25を取付けねじ24で螺着し、これを介して前記液面センサ28、フロート27などを取り付け得るようにした。

【0024】この場合、板状の取付けステー25に突起を設け、突出したこの突起と嵌合する凹所を取付けボス23などの蓋3側に設けるか、もしくはその反対に取付けボス23の上面に突起を設け、これと嵌合する穴もしくは凹部を取付けステー25側に設けると、一個の取付けねじ24の螺締着によって取付けステー25は固定されて、廻止めとなる。

【0025】もちろん、蓋3自体に前記取付け部を一体に形成可能であれば、わざわざ別個の取付けステー25を付設する必要はない。なお、図1の排水ポンプ1における前記旋回羽根11は3枚であって、その斜辺と軸心とのなす角度は20°、したがってその回転するときの軌跡のランナディスクに対する中心角は40°であるが、前記旋回羽根11の数および角度はこれに限るものではない。

【0026】なお、図1における二点鎖線で示す吐出口5を有する吐出接手6は図2に示す吐出接手6を本体2の縦軸心上90°右に旋回した場合の仮想線である。このように構成された本発明の排水ポンプ1は、図示しない空調機器の室内ユニットのドレンパンに、その流入口4を臨ませて取り付けられる。ドレンパンのドレン水の液位が上昇して、前記流入口4を塞ぐと、モータ20の回転と共に回転するランナ10の旋回羽根11によって流

入口4からドレンが吸い込まれ、掻き回されてその遠心力によって上昇し、旋回羽根11のランナデスク7と結合する基部に到り、そこからランナ流通路9を経て、さらに増大するランナデスク7の回転遠心力により増速かつ増圧されて、ランナデスク7を収めたほぼ漏斗状で上方大径側の本体2の側部の吐出接手6に備えた吐出口5から、これに接続された図示しない排水管を経て揚水排出される。

【0027】ポンプの流入口4から流入するドレンの揚水初期および連続揚水時でも、揚液中の混入気泡の存在は、この気泡と液とが旋回羽根11と衝突することによる騒音の発生となり、またこの気泡の混入は揚水作用を妨げるので、旋回羽根11を取り付けた軸心基部近傍と前記ランナボス17近傍間を連通する通気路を穿ち、これにより前記軸挿入口31とランナボス17との間隙を経て前記気泡を放出排除し、順調にポンプ作用が営まれる。そして前述の通り、ポンプの運転中に、ランナ10が回転する遠心力によって液体がランナ流通路9からその外周に放散され、吐出圧力を有しているにもかかわらず、前記軸挿入口31からその上方への溢水を防ぎかつ騒音を遮断するために、ランナデスク7のランナ流通路9の外周上部は、例えば天板をもって覆われるように遮蔽されていて、その外周上部と蓋3との間に旋回水層を形成させて遮音の効果をあげている。

【0028】さらに、上記旋回水層の水膜が前記通気路13を塞がぬように、ランナデスク7の上面、すなわち天板部16の上面にランナボス17から複数の補助羽根8を放射状にその外周まで突出させて、その回転遠心力でランナボス17の周囲、すなわち通気路13上面からの液体をその外周に向けて放散させて、前記旋回水層の形成を助長しかつ遮音効果とポンプの揚水吐出能力を高めるものである。

【0029】そして揚水中、揚程をポンプ能力の最大限度まで高めても、前記ランナボス17と軸挿入口31との間隙からの溢水は認められなかった。ポンプ停止時には、吐出接手6に接続した配管から揚程を逆流するドレン水がポンプ本体2を通り、流入口4を経てドレンパンに戻される。この際に、前記揚程が大であると、逆流するドレンの一部は前記軸挿入口31から若干量が溢れることがあるが、駆動軸21に嵌設した水切板22によってモータ20側、すなわち上方への噴出が遮られ、モータ20の再起動時には、水滴が振り切られる。

【0030】この逆流水が吐出口5から流入口4へ戻りやすくするためおよびポンプの吐出揚水時に気泡混入の水液を絞って効率を高めしかも騒音を低減するためにも、従来から、吐出口5の最小断面積は流入口4の断面積に比較してはるかに小さく、しかも軸挿入口31とランナボス17もしくは駆動軸21との間隙面積に比較しても小さくすることは従来から実施されている通例であ

る。

【0031】本発明の実施例においても、例えば図1の排水ポンプ1の場合、

流入口4の直径 D その断面積 S 、
軸挿入口31の直径 d_1 その断面積 a_1 、
ランナボス17の直径 d_2 その断面積 a_2 、
吐出口5の最小部直径 d その断面積 s
とすると、

$$\begin{aligned} D &= 10.5 \text{ mm} & S &= 86.6 \text{ mm}^2 \\ d_1 &= 12 \text{ mm} & a_1 &= 113.1 \text{ mm}^2 \\ d_2 &= 9 \text{ mm} & a_2 &= 63.6 \text{ mm}^2 \\ d &= 5 \text{ mm} & s &= 19.6 \text{ mm}^2 \\ a_1 - a_2 &= 49.5 \text{ mm} \end{aligned}$$

すなわち、 $S > (a_1 - a_2) > s$ となっている。

【0032】前述したポンプの本体2の高さを縮小するために、特に旋回羽根11を収容する漏斗状の逆円錐部分の高さを短くして、流入口4を超えたドレン水位が約10~13mm、要するに流入口4の下端がドレン液面にそれだけ埋設した状態でポンプを作動して揚水吐出させる場合が最も騒音が低くなる。これは、旋回羽根11の高さも短くなり、その回転により揚水したドレンが直ちに、遠心力が大きくて、より揚水吐出作用のすぐれたランナデスク7の流通路9に導かれるために、旋回羽根間が液で充満し、混入する気泡を減少させて、そこに発生する騒音を抑制する結果によるものである。

【0033】このランナ流通路9はほぼ逆凹字溝で放射状の外周部分はその深さを増大させたものであるが、ブレード形のものに比較して、ランナデスク形のは、もともと質量が大きくなり、これがその回転時にはフライホイールの作用をすると共に、ブレード形の場合のような水の衝撃に対する振動が少なく、これを減殺するので、したがって騒音も甚だ少なく抑えられる。

【0034】以上、図1と図2によって詳述した、小形軽量化した本発明の排水ポンプ1をAとし、図7と図8に示した小形軽量化された従来技術の排水ポンプ1'をBとし、さらに(イ)実開昭63-105796号、(ロ)実公平3-35915号公報に開示されたものなど50形~250形の空調機器に用いられる比較的大きな従来技術の排水ポンプをCとして、これらの吐出流量 m_l (ミリリットル毎分) / 吐出揚程 head mm、最大吐出揚程 mm、騒音 dB A、スケール、無響室内でマイクロフォンはポンプの水平方向距離1メートルで測定した。駆動電動機は限取線輪形誘導電動機を用い、A、Bは共に10W、Cは15W、電源は交流200V、50Hz、60Hzの回転数は前述した通りであり、ポンプ本体2、2'の流入口4、4'の下端部が13mm水没している場合の上記測定比較データを表1に示す。

【0035】

【表1】

排水 ポンプ	最大揚程 mm		吐出流量 mL/min.		騒音 dB	
			揚程 head mm			
	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
A	900	1100	700	820	29	32
			head 500 mm			
B	640	800	320	390	35	38
			head 400 mm			
C	1220	1550	1080	1280	42	44.5
			head 500 mm			

【0036】表1において、Bのポンプは、揚程(head) 500 mmでは吐出量が非常に減少するので、400 mmで吐出流量を測定したものである。このように、従来の50~250形空調機器用のドレン排水ポンプCに比較して、小形軽量化した従来技術のポンプBは特に揚水および排水能力が1/2 ~ 1/3 に減少する。これに比べて本発明の排水ポンプAは、前記ポンプBよりもさらに小形にしたにもかかわらず、その揚程および排水能力は前述したポンプCの約65~70%であり、ポンプBに対しては最大揚程が約40%増し、排水能力は倍増以上である。しかも、騒音は揭示したように、ポンプCよりはもとよりポンプBに比較してもはるかに低下している。

【0037】なお、表1に示すデータを(イ)、(ロ)のほか(ハ)(ニ)(ホ)の前記従来技術のものに比べても、その揚程と排水能力の効率および低騒音であることは、それぞれ若干の条件の相違があるにしても自明の事実である。なお、前述した複数個のほぼ逆三角形の羽根をもって構成されている旋回羽根11は、これに代えて軸心に対して捩じれ角を有するリードをもつねじポンプを形成するものであっても、その回転により初めに揚水を開始できるものである。

【0038】次に、本発明の他の実施の形態のランナ10'、10''について図3~図6によってこれを説明する。図3と図5は各実施の形態の斜視図であり、図4および図6は上記各斜視図で示したもののそれぞれ底面図である。図4のランナ流通路9'は、ランナ9'の回転方向の後ろ側に傾斜する斜面19を有するほぼ逆梯形溝状でかつ放射状の外周付近の溝の深さを大にしたものは、前記旋回羽根11'によって掻き回された気泡を含む液体が前記斜面19で抑圧されながら前記通気路13から抜けきれない気泡と共にランナデスク7'の外周方向に速やかに導かれ、流量も増加する一方、溝の斜面19をもつために、その側面に衝突する流体圧が減少し、したがって騒音や振動の発生をさらに減少させることができる。

【0039】図5と図6に示す本発明の他のランナ10''は、旋回羽根11'に連続した放射状に前記ランナ10''の天板16の下面に突設させた下放射羽根15

と、同じく天板16の上面に放射状に突設させた補助羽根8'は、一般の回転ポンプ、例えばポリユートポンプと類似の形状にしてもよい。また、前述した下放射羽根15はブレード状であってもよい。この下放射羽根15の間が流体を掻き回して通る流通路となる。下放射羽根15は図示するような3枚のものよりもその数のある程度増した方が騒音は概して低下する。

【0040】その他の各図における同一数字符号のものは図1、図2のものと同様であるから、その説明は省略する。

【0041】

【発明の効果】以上詳述したように、本発明による排水ポンプは次に述べるような効果を生じる。

(a) 旋回羽根に、これよりも大径でほぼ円盤状のランナデスクを結合したランナを有する遠心ポンプであり、したがって前記ランナデスクの下面に設けたランナ流通路は旋回羽根による揚液を充分通過させるに足る断面積を有すればよいので、一般の渦巻ポンプのように軸心側すなわち吸入側の空間を大きく占める必要がなく、したがってランナデスクの質量が比較的大きくとれるので、それ故に、その回転時にフライホイールの効果があり、旋回羽根からの揚液は比較的狭小で足りるランナ流通路を通過する際にその回転によって加速かつ増圧されて、ポンプの揚水吐出量を増大する一方、揚液中に混在する気泡は通気路から上昇放出され、そのために揚水中に旋回羽根やドレン流通路で揚液に加わる衝撃による振動や騒音の発生がきわめて少なく、このポンプを取り付けた空調機器における共振や共鳴音の発生も抑えられる。

【0042】(b) ランナデスクの流通路の上面を覆う天井のような天板により、ランナの回転する遠心力によって生ずる揚水吐出圧力のために、ランナ上部のランナボスと蓋に設けた軸挿入口の間隙から外部に揚液が流出することを防ぐと共に、わずかに上面に侵出した液体はランナデスクと蓋の内面との間に形成された旋回水層による水膜がポンプ本体内部で発生する作動音を外部に対して遮蔽する効果がある。

【0043】(c) ランナデスクに設けた通気路から上部に侵出する揚液は、ランナデスクの上面天板上に設けた

放射状の補助羽根によってその外周方向へ放出されて通気路を揚液で塞ぐことを防止する一方、前記の放出されて形成される旋回水層をさらに濾斗状の本体の大径側部へ押し出して、ポンプの揚水吐出能力をさらに助長する。

【0044】(d) 旋回羽根を収容する濾斗状本体の逆円錐部分の高さを短小にしたので、流入口の下端がドレンの液面から水没状態となったとき、旋回羽根より遠心力が大で揚水吐出能力を高めるランナデスクの流通路になるべく早く導き、前記旋回羽根間を液で充満させて、そこに混入する気泡を減少させて、騒音を抑制することおよび速やかに揚水作業を開始させることができる。

【0045】(e) ランナデスクのランナ流通路を、このランナの回転方向の後側すなわち逆方向側に傾斜する斜面を有する逆梯形溝状でかつその放射状の外周付近の溝の深さを大きくしたものは、前記旋回羽根により攪拌された気泡を含む液体が前記斜面によってランナの上面に上昇するのを抑圧されながら通気路から抜けきれない気泡と共に、ランナデスクの外周方向に速やかに導かれ、流量も増大する一方、溝の斜面をもつために、その側面に衝突する流体圧力が減殺され、騒音や振動の発生がさらに抑えられる。(f) 本体を覆いかつこれと結合する蓋の上側に水位を検知する液面センサなどの取付け部を備えたために、本体の高さを縮小することが可能になった。

【0046】(g) 蓋を結合する本体のフランジ部を、これを底面から見た円形の左右、もしくはおおよび上下またはいずれかの少なくとも一箇所の円弧の一部を削除して弦側部を形成したことにより、このポンプを空調機器に取り付ける場合の省スペースを可能としかつ省資材となる。

(h) 従来の旋回羽根とランナ流通路を結合したランナデスクの上面にさらに放射状の補助羽根を突設したことによって、従来の50形以下の空調機器のドレン排水用ポンプとして小形軽量化されたものよりもさらに小形で、しかも揚水、吐出能力を高め、その上騒音発生のはるかに低い排水ポンプを提供することが可能となった。

【図面の簡単な説明】

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*【図1】本発明の一実施の形態で、排水ポンプの一部断面を表す縦断説明図である。

【図2】図1に示す本発明の排水ポンプの底面図である。

【図3】本発明の他の実施の形態の排水ポンプのランナの斜視図である。

【図4】図3に示す本発明の排水ポンプのランナの底面図である。

【図5】本発明のさらに他の実施の形態の排水ポンプのランナの斜視図である。

【図6】図5の本発明の排水ポンプのランナの底面図である。

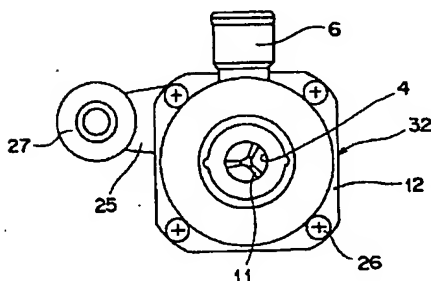
【図7】従来公知の技術に属する小型軽量化された排水ポンプの一部断面を表した縦断説明図である。

【図8】図7に示す従来技術の排水ポンプの底面図である。

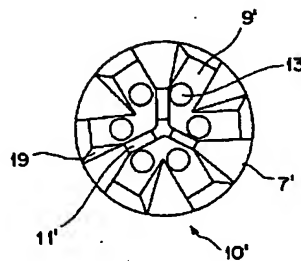
【符号の説明】

1, 1'	排水ポンプ
2, 2'	本体
3, 3'	蓋
4, 4'	流入口
5, 5'	吐出口
7, 7', 7"	ランナデスク
9, 9'	ランナ流通路
10, 10', 10"	ランナ
11, 11', 11"	旋回羽根
12, 12'	本体フランジ部
13, 13'	通気路
15	下放射羽根
17, 17'	ランナボス
20, 20'	モータ
24, 24'	取付けねじ
25, 25'	取付けステー
26, 26'	取付けねじ
28, 28'	液面センサ
31, 31'	軸挿入口
32	弦側部

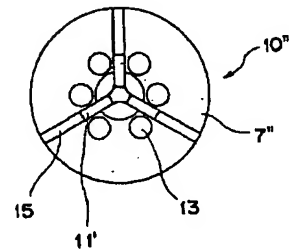
【図2】



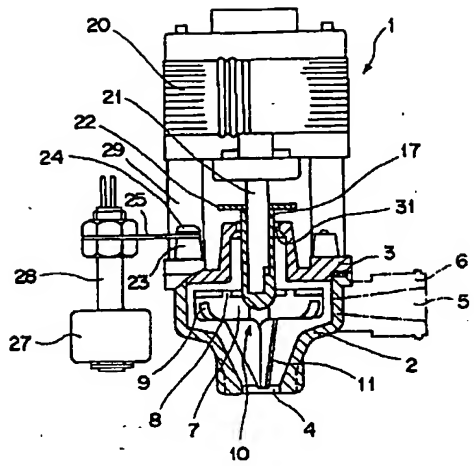
【図4】



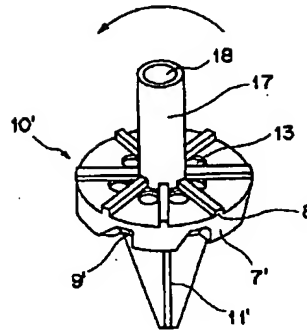
【図6】



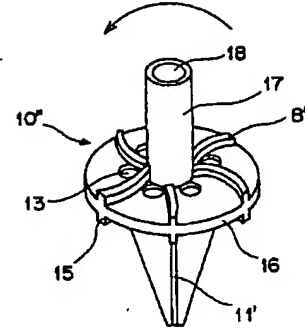
【図1】



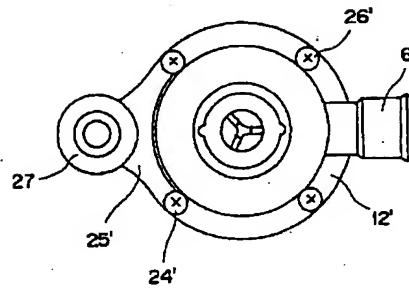
【図3】



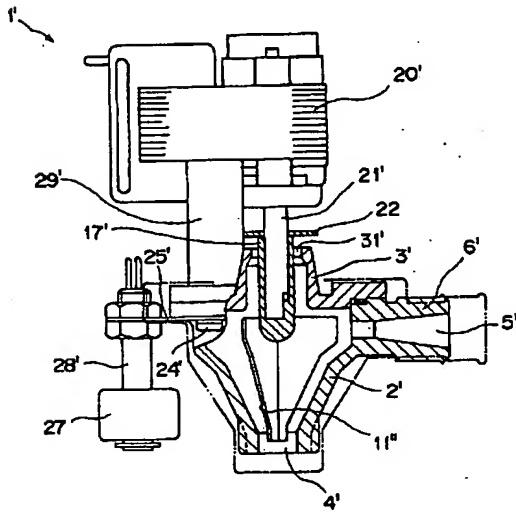
【図5】



【図8】



【図7】



フロントページの続き

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CLAIMS

[Claim(s)]

[Claim 1] The runner hub which was equipped with the body which has input in the lower limit section, and has a delivery mostly in the flank by the side of a major diameter upper by the shape of a funnel, and carried out fitting connection on the same axle inside this body at the driving shaft of a motor, The runner by which two or more swirl vanes were formed in an almost disc-like runner disc and its lower part at one It prepares so that said input may be made to face said swirl vane, and said runner disc may be stored [both] in the diameter side of shape top Masahiro of said funnel and it can rotate freely. Said runner disc While equipping the inferior surface of tongue with two or more runner circulation ways which are open for free passage from the axial center base of said swirl vane towards the periphery to a radial, in the top face The drainage pump characterized by installing the aeration way which makes two or more auxiliary wings protrude on a radial, and makes the between near [said] the runner hub near the axial center base of said swirl vane open for free passage.

[Claim 2] The runner hub which was equipped with the body which has input in the lower limit section, and has a delivery mostly in the flank by the side of a major diameter upper by the shape of a funnel, and carried out fitting connection on the same axle inside this body at the driving shaft of a motor, The runner by which two or more swirl vanes were formed in an almost disc-like runner disc and its lower part at one

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the self-priming-type non-positive-displacement-design rotary pump which pumps up the drain water (only henceforth a drain) generated by dew condensation on the heat exchanger front face of the indoor unit of air-conditioning equipment from a drain pan, and is discharged outside.

[0002]

[Description of the Prior Art] as the drainage pump which carries out pumping discharge of the drain generated from air-conditioning equipment etc. — (**) — JP,63-105796,U and (**) JP,3-35915,Y (Ha), JP,7-63188,A and (d) JP,8-210289,A and (e) There are many conventional techniques, so that a publication in each official report of JP,8-285307,A etc. is too many to mention.

[0003] Also in these conventional techniques, it is all cheap and what made the driving source the shading induction motor which is moreover durable is used. Said (b) Although the thing of the real fairness No. 35915 [three to] official report has prepared the gas inflow section into which atmospheric air is made to flow near the driving shaft of that wing, this gas inflow section is the stoma which is illustrated. By rotation of said wing, impurity, such as drain underwater dust, bacteria, and a water scale, disperses. Since it adheres to said stoma, blinding is produced and aeration is intercepted, and since the clearance between a driving shaft and a lid bars drive rotation of a motor by fixing of the impurity contained all over said drain

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the self-priming-type non-positive-displacement-design rotary pump which pumps up the drain water (only henceforth a drain) generated by dew condensation on the heat exchanger front face of the indoor unit of air-conditioning equipment from a drain pan, and is discharged outside.

[Translation done.]

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PRIOR ART

[Description of the Prior Art] as the drainage pump which carries out pumping discharge of the drain generated from air-conditioning equipment etc. -- (**) -- JP,63-105796,U and (**) JP,3-35915,Y (Ha), JP,7-63188,A and (d) JP,8-210289,A and (e) There are many conventional techniques, so that a publication in each official report of JP,8-285307,A etc. is too many to mention.

[0003] Also in these conventional techniques, it is all cheap and what made the driving source the shading induction motor which is moreover durable is used. Said (b) Although the thing of the real fairness No. 35915 [three to] official report has prepared the gas inflow section into which atmospheric air is made to flow near the driving shaft of that wing, this gas inflow section is the stoma which is illustrated. Since impurity, such as drain underwater dust, bacteria, and a water scale, disperses, it adheres to said stoma, blinding is produced and aeration is intercepted by rotation of said wing and -- since the clearance between a driving shaft and a lid bars drive rotation of a motor by fixing of the impurity contained all over said drain -- in practice -- any of said conventional example -- although -- gap sufficient between the holes of the upper part of the lid with which these are fitted in with the anchoring boss of a driving shaft or a swirl vane is given, and it is made to serve as the air circulation section

[Translation done.]

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MEANS

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the drainage pump by this invention The runner hub which was equipped with the body which has input in the lower limit section, and has a delivery mostly in the flank by the side of a major diameter upper by the shape of a funnel, and carried out fitting connection on the same axle inside this body at the driving shaft of a motor, The runner by which two or more swirl vanes were formed in an almost disc-like runner disc and its lower part at one It prepares so that said input may be made to face said swirl vane, and said runner disc may be stored [both] in the diameter side of shape top Masahiro of said funnel and it can rotate freely. Said runner disc While equipping the inferior surface of tongue with two or more runner circulation ways which are open for free passage from the axial center base of said swirl vane towards the periphery to a radial, in the top face Two or more auxiliary wings are made to protrude on a radial, and it is characterized by installing the aeration way which makes the between near [said] the runner hub near the axial center base of said swirl vane open for free passage.

[0008] Moreover, the runner hub which was equipped with the body which has input in the lower limit section, and has a delivery mostly by this invention in the flank by the side of a major diameter upper by the shape of a funnel, and carried out fitting connection on the same axle inside this body at the driving shaft of a motor, The runner by which two or more swirl vanes were formed in an almost disc-like runner disc and its lower part at one It prepares so that said input may be made to face said swirl vane, and said runner disc may be stored [both] in the diameter side of shape top Masahiro of said funnel and it can rotate freely. Said runner disc While having two or more rustication Ibane roots which connected with said swirl vane and protruded on the inferior surface of tongue towards the periphery at the radial Two or more auxiliary wings are made to protrude on the top face at a radial. The rustication Ibane root and auxiliary wing of these The drainage pump characterized by installing through moreover and an inferior surface of tongue the aeration way of the runner hub of the runner disc of the shape of a top plate made to protrude, respectively and said swirl vane which opens between bases for free passage, respectively can also attain the same purpose.

[0009] Furthermore, the plurality of said swirl vane is an inverse triangle mostly, or said swirl vane can also form the screw pump which is twisted to an axial center, and has an angle, and has a lead. moreover, said runner circulation way is a reverse concave letter slot mostly, or has an inclination in the backside of the hand of cut of a runner — it is a reverse trapezium slot mostly. Furthermore, it is convenient to equip the lid bottom which has said driving shaft and axial insertion opening of a runner hub, covers said body, and combines with this, and attaches said motor with the attachment sections, such as a liquid level sensor which detects water level.

[0010] And as for the flange of said body combined with a lid, it is convenient on space-saving that the circular right and left or the bowstring flank which reached and deleted the upper and lower sides or one of at least one radii [a part of] which looked at this from the base is formed again.

[0011]

[Embodiment of the Invention] Although the drawing attached about the gestalt of operation of

this invention explains hereafter, drawing 7 and drawing 8 describe the outline about the drainage pump of the conventional technique first before that. This is 50 forms (2 horsepower) mentioned above. The drainage pump miniaturized in order to use for wastewater of the drain of for home use [following] and small business-use air-conditioning equipment is what showed the longitudinal-section explanatory view showing a cross section, and the bottom view to drawing 7 and drawing 8 , respectively a part. input 4' faced and located in the drain pan which is not illustrated to a lower limit was prepared, and delivery 5' was prepared in the upper part flank — in body 2' of a hollow reverse cone form mostly this — a body — two — ' — an inside — a gap — having — rotating — plurality — almost — an inverse triangle — a wing — having had — a swirl vane — 11 — " — one — a runner hub — 17 — ' — It has a gap suitably with axial insertion opening 31 of lid 3' in which covers said body 2' and screw fastening is carried out by mounting screw 26' , and attachment connection is carried out at driving shaft 21 of motor 20' which attached in the upper part of said lid 3' , and was attached in stem 29' .

[0012] The weather molding 22 is fixed on driving shaft 21' in the upper part of said runner-hub 17'. Moreover, it can also have liquid level sensor which detects oil level of drain water to stay 25' by attaching 28 in which screw fastening arrival was carried out to the lower part of flange 12' of body 2' by mounting screw 24' ' etc.

[0013] Illustrated liquid level sensor 28' has float 27. By change of an oil level Namely, if drain water turns into at least fixed water of a drain pan, will detect this and a switch will be turned on. If motor 20 of drainage pump 1' ' is started, or drainage pump 1' should break down, the water level of a drain pan goes up during regular operation and the watch liquid level of an overflow stream is reached A signal is emitted, and it reaches or there is the usage of ****(ing) the power source of air-conditioning equipment with a relay, it replaces with float 27 and a photosensor etc. is used.

[0014] Thus, the drain water which went up having flowed from input 4' and circling to an upper major-diameter side according to the centrifugal force by rotation of a swirl vane when the drain water of a drain pan crossed the lower limit of 11" of swirl vanes is discharged by the rise exterior through the conduit linked to regurgitation fitting 6' which is not illustrated from delivery 5'. Incidentally, what was drawn and shown with the two-dot chain line in drawing 7 is 50-250 which were mentioned above. Form (2-10 horsepower) Said conventional technique used for drain wastewater of air-conditioning equipment in which extensive discharge and its head are also comparatively large (I) JP,63-105796,U (RO); They are some profile Figs. of the flange of the body of the drainage pump in which a full size comparison is shown mostly and lid of real examples, such as a thing of a JP,3-35915,Y indication.

[0015] Although the comparison of the capacity of the pump of this conventional, comparatively large-sized thing and the thing which miniaturized this is mentioned later, the ratio of the dimension of the path of the moving vane of a flange or a runner is about 10:8 as an example of a comparison of that magnitude. And for 15 W, 10W, and each rotational frequency, in the case of observation AC 200V and 50 Hz, each drive motor is 2800 RPM and 60 Hz by the factor slipping of a motor to be at the time of a load. It was 3360 RPM extent at the case.

[0016] And the above (I) which presents with the drainage pump by these conventional techniques the application for which the noise under pumping exceeds said 50 forms as shown in Table 1, (RO) etc. — the drainage pump used for the air-conditioning equipment of 50 or less forms shown in drawing 7 and drawing 8 which it was fairly large and were formed into small lightweight in a comparatively large-sized thing In addition, the noise was size comparatively, this noise and vibration emitted a jarring sound within the indoor unit of air-conditioning equipment equipped with these drainage pumps, and this cure against noise abatement was a technical problem.

[0017] Moreover, of course, as for the thing of the conventional technique shown in drawing 7 and drawing 8 which measured small lightweight-ization, wastewater capacity declines. The thing of the one more step of formation of small lightweight, a ***** tooth space, and still the low noise [pan / by which moreover raised discharging performance by the low price, and quality was stabilized] is demanded. [drainage sump pump / which much more small lightweight-ization also including current and said air-conditioning equipment of 50 or less forms is measured

therefore is attached in these devices]

[0018] In response to the needs of such a commercial scene, drawing 1 and drawing 2 which show the gestalt of that one operation of the drainage pump of this invention made in order to solve this technical problem explain. Drawing 1 is the longitudinal-section explanatory view of the drainage pump 1 of this invention having shown the cross section in part, and drawing 2 is the bottom view of drawing 1. The configuration of this invention is as the column of a claim having described, and the difference with the conventionally well-known advanced technology, for example, especially the different point of what was stated by drawing 7 and drawing 8, is having formed the anchoring boss 23 who does screw fastening arrival of this to a runner 10, the flange 12 of a body 2, and the anchoring stay 25 for attaching a liquid level sensor 28 in the upper part of a lid 3 by the mounting screw 24.

[0019] Other configurations are the same as that of the sign of the figure except the dash of drawing 7 and drawing 8. First, two or more swirl vanes 11 are formed in the runner hub 17 which carried out fitting connection at the same axle, and the almost disc-like runner disc 7 and its lower part by the driving shaft 21 of a motor 20 at one, a runner 10 makes the input 4 of the lower part of a body 2 face said swirl vane 11, and said both runner discs 7 are stored in the diameter side of shape top Masahiro of a funnel of said body 2 free [rotation].

[0020] And this runner disc 7 has drilled in it the aeration way 13 (refer to drawing 3 - drawing 6) which two or more auxiliary wings 8 are protruded [way] on that top face at the radial, and makes a runner disc 7 open between said about 17 runner hubs near the axial center base of said swirl vane 11 for free passage while equipping that inferior surface of tongue with two or more runner circulation ways 9 which are open for free passage from the axial center base of said swirl vane 11 toward that periphery to a radial.

[0021] space-saving [in the case of attaching this drainage pump 1 in air-conditioning equipment] — taking into consideration — a body 2 — or — about the seat of the mounting screw 26 which, in addition to this, carries out screw fastening arrival of the circular four corners where these body flanges 12 looked at this from that base with the wrap lid 3, or two or more of these both — leaving — right and left — or — and the bowstring flank which deleted the upper and lower sides or one of at least one radii [a part of] is formed. It is also the same as when combining the lid 3 of each other with a body 2 other than screw fastening arrival by screwing or hook by the mounting screw 26.

[0022] In addition, when deleting a part of radii of the flange 12 of the body 2 shown in drawing 2, and forming the bowstring flank 32, it replaces with deleting a part of radii, it leaves the part of the anchoring seat for mounting screws 26 of a flange 12 in the shape of [so-called] a lug, and even if it has the side face which excised linearly and was formed, it does not interfere. The advantage which lessens the so-called lug in case this attaches a liquid level sensor 28 etc. to becoming reduction of material expense and the outside of a body 2 as well as a ***** tooth space is produced.

[0023] And the height of that body 2 is reduced from forming this drainage pump 1 into small lightweight further, and the purpose of noise-reduction-izing mentioned later. therefore, the inferior surface of tongue of flange 12' of body 2' in the conventional technique — this and one — or what forms liquid level sensor 28', float 27, etc. through anchoring stay 25' did not have allowances in an anchoring tooth space, and became impossible. So, it attaches in the top-face side of said lid 3, a boss 23 is attached in preparation for one, stay 25 is screwed on by the mounting screw 24, and it enabled it to attach said liquid level sensor 28, float 27, etc. through this in this invention.

[0024] In this case, if attach the hollow which fits in with this projection that prepared the projection in the tabular anchoring stay 25, and was projected, and it prepares in the lid 3 side, such as a boss 23, or that hole that attaches on the contrary, prepares a projection in a boss's 23 top face, and fits in with this, or a crevice is attached and it prepares in a stay 25 side, it will attach by the screw fastening of the mounting screw 24 of a piece, and stay 25 is fixed, and it becomes eye rotation stopping.

[0025] Of course, if formation to one is possible to lid 3 the very thing in said anchoring section, it is not necessary to it to attach the separate anchoring stay 25 specially. In addition, although

the number of said swirl vanes 11 in the drainage pump 1 of drawing 1 is three and a central angle [as opposed to the runner disc of 20 degrees, therefore that locus when rotating in the include angle of the oblique side and axial center to make] is 40 degrees, the number and include angle of said swirl vane 11 are not restricted to this.

[0026] In addition, the regurgitation fitting 6 which has the delivery 5 shown with the two-dot chain line in drawing 1 is an imaginary line at the time of circling in the regurgitation fitting 6 shown in drawing 2 on the right of [axis-of-ordinate alignment top 90 degree] a body 2. Thus, the drainage pump 1 of constituted this invention makes the drain pan of the indoor unit of the air-conditioning equipment which is not illustrated overlook the input 4, and is attached. If the liquid level of the drain water of a drain pan goes up and said input 4 is plugged up, a drain will be absorbed from input 4 with the swirl vane 11 of a runner 10 which rotates with rotation of a motor 20. It is stirred, go up according to the centrifugal force, and the base combined with the runner disc 7 of a swirl vane 11 is reached. The rotation centrifugal force of the runner disc 7 which increases further through the runner circulation way 9 from there accelerates and boosts. Pumping discharge is mostly carried out through the drain pipe which was connected to this which stored the runner disc 7 from the delivery 5 with which the regurgitation fitting 6 of the flank of the body 2 by the side of the diameter of top Masahiro was equipped by the shape of a funnel and which is not illustrated.

[0027] Also in the time of the pumping early stages of the drain which flows from the input 4 of a pump, and continuation pumping, existence of the mixing air bubbles in **** Since this air bubbles and liquid serve as generating of the noise by colliding with a swirl vane 11 and mixing of these air bubbles bars a pumping operation The aeration way near [in which the swirl vane 11 was attached] the axial center base which opens between said about 17 runner hubs for free passage is dug, emission exclusion of said air bubbles is carried out through the gap of said axial insertion opening 31 and runner hub 17 by this, and a pump action is performed favorably. And in spite of stripping of the liquid being carried out to the periphery from the runner circulation way 9 by the centrifugal force which a runner 10 rotates during operation of a pump and having the discharge pressure according to it as above-mentioned In order to protect the overflow stream to the upper part from said axial insertion opening 31 and to intercept the noise, the periphery upper part of the runner circulation way 9 of a runner disc 7 is covered so that it may have a top plate and may be covered, it makes a revolution water layer form between the periphery upper part and lid 3, and is obtaining the effectiveness of noise insulation.

[0028] So that the water screen of the above-mentioned revolution water layer may not take up said aeration way 13 Furthermore, the top face of a runner disc 7, Namely, two or more auxiliary wings 8 are made to project from a runner hub 17 to the periphery to a radial on the top face of the top-plate section 16. Stripping of the liquid from the perimeter of a runner hub 17, i.e., aeration way 13 top face, is turned and carried out to the periphery with the rotation centrifugal force, and formation of said revolution water layer is promoted, and an effect of intercepting noise and the pumping regurgitation capacity of a pump are heightened.

[0029] And during pumping, even if it raised the head to the maximum of pump capacity, the overflow stream from the gap of said runner hub 17 and the axial insertion opening 31 was not accepted. The drain water which flows backwards the head from piping linked to the regurgitation fitting 6 at the time of a pump halt passes along a pump body 2, and is returned to a drain pan through input 4. In this case, if said head is size, the jet to the upper part will be interrupted a motor 20 side by the weather molding 22 which fixed some drains which flow backwards on the driving shaft 21 although the amount might overflow a little from said axial insertion opening 31, and waterdrop will be shaken off at the time of the reboot of a motor 20.

[0030] In order that this back water may be return-easy to input 4 and may carry out from a delivery 5 to it, and also in order to wring the water of cellular mixing, to raise effectiveness at the time of regurgitation pumping of a pump and to reduce the noise moreover Even if the minimum cross-sectional area of a delivery 5 is far small as compared with the cross-sectional area of input 4 and it moreover compares with the axial insertion opening 31, a runner hub 17, or gap area with a driving shaft 21 from the former, making it small is usually which is carried out from the former.

[0031] Also in the example of this invention in the case of the drainage pump 1 of drawing 1, for example The diameter of input 4 D The cross-sectional area S, diameter of the axial insertion opening 31 d1 Diameter d2 of the cross-sectional-area a1 runner hub 17 The minimum section diameter d of the cross-sectional-area a2 delivery 5 When it is the cross-sectional area s, $D=10.5 \text{ mm}$ $S=86.6 \text{ mm}^2$ $d1=12 \text{ mm}$ $a1=113.1 \text{ mm}^2$ $d2=9 \text{ mm}$ $a2=63.6 \text{ mm}^2$ $d=5 \text{ mm}$ $s=19.6 \text{ mm}^2$ $a1-a2=49.5 \text{ mm}$, i.e., $S > (a1-a2) > s$, It has become.

[0032] the drain which shortened the height of the reverse cone part of the shape of a funnel which holds especially the swirl vane 11, and exceeded input 4 in order to reduce the height of the body 2 of the pump mentioned above — the noise becomes [the case where water level operates and carries out the pumping regurgitation of the pump in about ten to 13 mm, and the condition that the lower limit of input 4 laid under the drain oil level so much in short] low most. The height of a swirl vane 11 also becomes short, since the drain pumped up by the rotation is immediately led to the circulation way 9 of the runner disc 7 which whose centrifugal force was large and was more excellent in pumping emiocytosis, between swirl vanes is full of liquid, and this decreases the air bubbles to mix, and is based on the result which controls the noise generated there.

[0033] Although the periphery part of a radial increases [way / 9 / this / runner circulation] that depth mostly in a reverse concave letter slot It compares with the thing of a blade form. The thing of a runner disc form While mass becomes large from the first and this carries out an operation of a flywheel at the time of the rotation, there is little vibration to the impact of water like [in the case of a blade form], and since this is reduced therefore, there is also very little noise and it is stopped.

[0034] As mentioned above, the drainage pump 1 of this invention formed into small lightweight explained in full detail by drawing 1 and drawing 2 is set to A. Drainage pump 1' of the conventional technique which was shown in drawing 7 and drawing 8 and which was formed into small lightweight is set to B. Furthermore, they are (b) JP,63-105796,U and (b). 50 form -250, such as what was indicated by JP,3-35915,Y The drainage pump of the comparatively big conventional technique used for formal air-conditioning equipment is set to C. These amounts of discharge flow ml (milliliter per minute) / regurgitation head head mm, the maximum regurgitation head The microphone was measured in the horizontal distance of 1 meter of a pump in mm, the noise dB A scale, and the anechoic chamber. A driving motor uses a shading coil form induction motor, and both A and B are 10W and C. 15W and a power source are as having mentioned above, and a pump body 2, the input 4 of 2', and the lower limit section of 4' are [the rotational frequency of alternating current 200V, 50 Hz and 60 Hz] 13 mm. The above-mentioned measurement comparison data in the case of having sunk are shown in Table 1.

[0035]

[Table 1]

排水 ポンプ	最大揚程 mm		吐出流量 mL/min.		騒音 dB	
			揚程 head mm			
	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
A	900	1100	700	820	29	32
			head 500 mm			
B	640	800	320	390	35	38
			head 400 mm			
C	1220	1550	1080	1280	42	44.5
			head 500 mm			

[0036] In Table 1, since discharge quantity decreases very much in head (head) 500 mm, the pump of B measures the amount of discharge flow by 400 mm. Thus, conventional 50-conventional 250 Especially for the pump B of the conventional technique formed into small

lightweight, as compared with drainage-sump-pump C for form air-conditioning equipment, pumping and wastewater capacity are $1/2 - 1/3$. It decreases. In spite of having made drainage pump A of this invention still smaller than said pump B compared with this, the head and wastewater capacity are about 65 - 70% of the pumps C mentioned above, and the maximum head of increase and wastewater capacity is more than redoubling about 40% to Pump B. And as notified, even if it compares the noise with Pump B from the first from Pump C, it is falling far. [0037] In addition, even if it compares with the thing of said conventional technique of (d) (e) besides (**) and (**) (Ha) the data shown in Table 1, it is an obvious fact that it is the effectiveness and the low noise of the head and wastewater capacity, even if there is a difference of some conditions, respectively. In addition, even if two or more swirl vanes 11 which were mentioned above and which are mostly constituted with the wing of an inverse triangle form a screw pump with the lead which replaces with this, is twisted to an axial center, and has an angle, they can start pumping first by the rotation.

[0038] Next, drawing 3 - drawing 6 explain this about runner 10' of the gestalt of other operations of this invention, and 10." Drawing 3 and drawing 5 are the perspective views of the gestalt of each operation, and although each above-mentioned perspective view showed drawing 4 and drawing 6, they are each a bottom view. runner circulation way 9' of drawing 4 has the slant face 19 which inclines in the backside of the hand of cut of runner 9' -- almost -- a reverse trapezium groove -- and what made size the depth of flute near the periphery of a radial The air bubbles which cannot finish falling out from said aeration way 13 while the liquid containing the air bubbles stirred by said swirl vane 11' is oppressed on said slant face 19 are both also promptly led in the direction of a periphery of runner disc 7'. Since it has the slant face 19 of a slot while a flow rate also increases, the hydrostatic pressure which collides with the side face can decrease, therefore generating of the noise or vibration can be decreased further.

[0039] Auxiliary wing 8' which made the radial protrude on the top face of a top plate 16 as well as the rustication Ibane root 15' who made the inferior surface of tongue of the said runner 10" top plate 16 protrude on the radial which followed swirl vane 11' other runner 10" of this invention shown in drawing 5 and drawing 6 may be made into a configuration similar to a common rotary pump, for example, a volute pump. Moreover, the rustication Ibane root 15 mentioned above may be a blade-like. Between this rustication Ibane root 15 serves as a circulation way which stirs and passes along a fluid. As for the noise, the direction which increased the number to some extent rather than a thing of three sheets which is illustrated falls generally.

[0040] Since the thing of the same figure sign in each other drawings is the same as that of the thing of drawing 1 and drawing 2, the explanation is omitted.

[Translation done.]

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, there is a possibility that it may become generating of the blow sound to the drain water and the cellular mixing fluid of a swirl vane during pumping of a pump to have given this sufficient gap, and it may serve as overflow opening of the back water immediately after a pump pumping halt further. Moreover, its conventional drainage pump was still inadequate, although it generated inevitably, therefore this overflow had to take prevention measures, such as anchoring of noise insulation, protection against dust, and dripproof covering, when the head was raised.

[0005] moreover — said — it carried out — especially — (**) JP,63-105796,U and (**) the thing of the conventional technique of an indication in the official report of JP,3-35915,Y — about — 50-250 Form (2-10 horsepower) Although the application of drain wastewater of business-use, comparatively large-sized air-conditioning equipment was presented Current is 2. It comes to be used also for the air-conditioning equipment indoor unit of an equivalent for horsepower, and the head-lining flush type of 50 or less molds small business-use and for home use, therefore a drainage pump is also the present condition that the formation of small lightweight and low noise-ization are demanded strongly, more.

[0006] While you explained this invention above, it was made in order to solve the trouble of said conventional technique mentioned further later, and forming further especially vibration of a drainage pump and noise abatement into small lightweight from the first, are few in heightening the ***** capacity and an anchoring tooth space, and let it be the technical problem to raise endurance and economical efficiency moreover.

[Translation done.]

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EFFECT OF THE INVENTION

[Effect of the Invention] As explained in full detail above, the drainage pump by this invention produces effectiveness which is described below.

(a) It is the centrifugal pump which has the runner which combined the runner disc almost more nearly disc-like than this at a major diameter with the swirl vane. Therefore, since the runner circulation way established in the inferior surface of tongue of said runner disc should just have the cross section made sufficient for passing **** by the swirl vane enough Since it is not necessary to occupy greatly an axial center side, i.e., the space of an inlet side, like a common centrifugal pump, therefore the mass of a runner disc can take comparatively greatly So, while there is effectiveness of a flywheel at the time of the rotation, the rotation accelerates and boosts it in case **** from a swirl vane passes through the runner circulation way for which is comparatively narrow and it is sufficient, and increasing the pumping discharge quantity of a pump, rise emission is carried out from an aeration way, therefore the air bubbles intermingled in **** are boiled. There are very little vibration by the impact added during pumping on a swirl vane or a drain circulation way at **** and generating of the noise, and the resonance in the air-conditioning equipment furnished with this pump and generating of a resonance are also suppressed.

[0042] (b) It is a top plate like wrap head lining about the top face of the circulation way of a runner disc, While preventing **** flowing out of the gap of axial insertion opening established in the runner hub and lid of the runner upper part outside for the pumping discharge pressure produced according to the centrifugal force which a runner rotates, the liquid which encroached on the top face slightly is effective in the water screen by the revolution water layer formed between the runner disc and the inside of a lid covering the switching noise generated inside a pump body to the exterior.

[0043] (c) While **** which encroaches on the upper part from the aeration way established in the runner disc prevents it being emitted in the direction of a periphery, and taking up an aeration way with the auxiliary wing of the radial prepared on the top-face top plate of a runner disc by ****, it extrudes further the revolution water layer which the above is emitted and is formed to the major-diameter flank of a funnel-like body, and promotes the pumping regurgitation capacity of a pump further.

[0044] (d) Since the height of the reverse cone part of the funnel-like body which holds a swirl vane was made little, when the lower limit of input changes into a submersion condition from the oil level of a drain, from a swirl vane, if possible, a centrifugal force leads to the circulation way of the runner disc which heightens pumping regurgitation capacity in size early, makes between said swirl vanes full of liquid, decreases the air bubbles mixed there, and controls the noise — and a pumping activity can be made to start promptly

[0045] By the reverse trapezium groove which has the slant face which inclines the runner circulation way of a runner disc in the backside, i.e., hard flow, side of the hand of cut of this runner, (e) And the thing which enlarged the depth of flute near the periphery of that radial While it is oppressed that the liquid containing the air bubbles stirred with said swirl vane goes up on the top face of a runner by said slant face, the air bubbles which cannot finish falling out from an aeration way are both also promptly led in the direction of a periphery of a runner disc, and a

flow rate also increases. On the other hand, since it has the slant face of a slot, the fluid pressure which collides with the side face is reduced, and generating of the noise or vibration is suppressed further. (f) Since the lid bottom which covers a body and is combined with this was equipped with the anchoring sections, such as a liquid level sensor which detects water level, it became possible to reduce the height of a body.

[0046] (g) the circular right and left which looked at this for the flange of the body which combines a lid from the base — or — and by having deleted the upper and lower sides or one of at least one radii [a part of], and having formed the bowstring flank, make possible space-saving [in the case of attaching this pump in air-conditioning equipment], and it becomes *****.

(h) By having protruded the auxiliary wing of a radial on the top face of the runner disc which combined a conventional swirl vane and a conventional runner circulation way further, it was still smaller than what was formed into small lightweight as a pump for drain wastewater of the conventional air-conditioning equipment of 50 or less forms, moreover pumping and regurgitation capacity were heightened, and it became possible to offer the far low drainage pump of the upper noise generating.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] With the gestalt of 1 operation of this invention, it is the vertical section explanatory view of a drainage pump which expresses a cross section in part.

[Drawing 2] It is the bottom view of the drainage pump of this invention shown in drawing 1.

[Drawing 3] It is the perspective view of the runner of the drainage pump of the gestalt of other operations of this invention.

[Drawing 4] It is the bottom view of the runner of the drainage pump of this invention shown in drawing 3.

[Drawing 5] It is the perspective view of the runner of the drainage pump of the gestalt of the operation of further others of this invention.

[Drawing 6] It is the bottom view of the runner of the drainage pump of this invention of drawing 5.

[Drawing 7] It is the vertical section explanatory view of the drainage pump which belongs to a well-known technique conventionally and which was formed into small lightweight which expressed the cross section in part.

[Drawing 8] It is the bottom view of the drainage pump of the conventional technique shown in drawing 7.

[Description of Notations]

1 1' Drainage pump

2 2' Body

3 3' Lid

4 4' Input

5 5' Delivery

7, 7', 7" Runner disc

9 9' Runner circulation way

10.10', 10" Runner

11, 11', 11" Swirl vane

12 12' Body flange

13 13' Aeration way

15 [] Rustication Ibane Root

17 17' Runner hub

20 20' Motor

24 24' Mounting screw

25 25' Anchoring stay

26 26' Mounting screw

28 28' Liquid level sensor

31 31' Axial insertion opening

32 [] Bowstring Flank

[Translation done.]